physical grounding to biological inquiry, but other theorists were interested in the apparently special powers of protoplasm in metabolic processes. I will discuss some of the most prominent chemical accounts of protoplasm in the second part of this chapter.

Returning to cytology, the second half of the nineteenth century was a period of very active investigation. The technique of microscopy underwent significant changes in the decades after 1850. I have already noted the introduction of apochromatic lenses, which further reduced chromatic aberrations. Although chemical reagents such as chromic acid had sometimes been applied as preservatives and "hardening agents," a major step was the discovery that using osmic acid as a fixative would preserve the fine detail of cells (although it also gave rise to the question of whether it revealed existing structure or generated artifacts). Schultze (1865) pioneered this approach in his study of the luminescent organ of the glowworm. Fixation served both to kill the cells in the tissue and to stabilize the structure that would otherwise be disrupted postmortem by processes of *autolysis*. Embedding in hard materials was important because it made it possible to cut thin slices of material through a process known as *sectioning*. The contents of a given section could then be viewed without being occluded by the contents of other sections.

Equally important was the development of stains that would selectively color different components of cells. Carmine red was the first stain to be employed in this way, by Alfonso Corti and Joseph von Gerlach in the 1850s. (Produced from the crushed and dried bodies of chochineal insects in Mexico, it had been used there as a dye for centuries.) Gerlach found that the nucleus selectively absorbed carmine, resulting in a far clearer image of it than had been available previously. In the following decade Böhmer applied hematoxylin, obtained from logwood, a tropical American tree, to stain the nucleus deep blue. In the 1850s William Perkin discovered aniline dyes while he was trying to synthesize quinine, and in the 1860s–70s other investigators determined that some aniline dyes would stain parts of the cell not affected by carmine or hematoxylin. This made it possible to stain different structures in different colors.

The greatest advances in understanding cell mechanisms in the second half of the nineteenth century involved the events of cell division. As I noted previously, Brown gave the nucleus its name and Schleiden proposed a central role for it in his account of cell formation. As accounts in terms of division of existing cells supplanted Schleiden's and Schwann's accounts of crystal-like cell formation, there was considerable uncertainty about the role of the nucleus. Karl Bogislaus Reichert (1847) contended that the nucleus disappeared when cells divided and that new nuclei were created in daughter cells.